

BEFORE THE  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

In the Matter of )  
 )  
 ) IB Docket No. 01-96  
The Establishment of Policies and )  
Service Rules for the Non-Geostationary )  
Satellite Orbit, Fixed Satellite Service in the )  
Ku-Band )

COMMENTS ON THE FURTHER NOTICE  
OF PROPOSED RULEMAKING

I. INTRODUCTION

In its Report and Order ("R&O") for the licensing and service rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service ("NGSO FSS"), IB Docket No. 01-96, the Federal Communications Commission (the "Commission") solicits comments on two proposals. One proposal is to adopt a methodology by which NGSO FSS applicants will demonstrate that they meet a limit on their interference into geostationary-satellite orbit ("GSO") systems operating in shared frequencies. Specifically, the Commission proposes to adopt the newly developed International Telecommunications Union Radiocommunication ("ITU-R") studies on the power flux density criteria that sets the bounds of NGSO and GSO sharing in the Ku-Band frequencies. Under this proposal, all NGSO FSS licensees would be required to demonstrate that they collectively meet a limit on aggregate power flux density. The Commission also requests comment on a second proposal to refine the definition of an in-line interference event to accommodate high-powered NGSO FSS systems. Additionally, Denali is compelled to comment on the Commission's requirement, presented in the R&O, for applicants to this Ku-band proceeding to provide service coverage to geographic areas encompassing both the Southern and Northern Hemispheres. Denali Telecom, L.L.C. ("Denali") has an application pending before the Commission for Authority to Launch and Operate Thirteen Satellites in the Pentriad System in the International Fixed-Satellite Service and the Mobile Satellite Service, filed September 27, 1997 (and amended September 16, 2002), File No. 160-SAT-P/LA-97 (the "Pentriad System") and submits these Comments to the issues raised in the FNPRM.

II. THE COMMISSION SHOULD NOT ADOPT A METHODOLOGY BASED ON MAINTAINING A  
FIXED EARTH STATION AVOIDANCE ANGLE OF TEN DEGREES.

Denali does not support the methodology proposed by the Commission for the determination of an in-line interference event. Though supporting the general idea of implementing the avoidance of interference events, Denali does not support the adoption of the proposed ITU-R methodology, as its use would not generate results that would provide for greater efficiency in the use of the allocated spectrum by all of the applicants. The avoidance of in-line interference events has the potential to

incorporate sufficient flexibility, and promote and accommodate spectrum coordination. It is intended by the Commission as a practical solution that is structured to mitigate the effects of varying regulatory and sharing constraints associated with allocation. This avoidance of in-line interference event option requires sub-dividing the NGSO FSS spectrum only during the time intervals involved in potential in-line interference events. One distinctive characteristic of all proposed NGSO FSS systems is the directivity of the satellite and earth station antennas they must employ. Separate NGSO FSS systems could share the same spectrum frequency and coverage so long as they avoid near in-line interference events.

The traditional approach by the Commission for minimizing the interference events is to utilize a nominal antenna pattern and flux density to maintain limits below the thermal noise. The ITU-R methodology would not allow for the calculation of the aggregate power flux density produced by all NGSO FSS systems. Furthermore, full-scale simulations have not been run by all the applicants, so it is preferred by this applicant that a methodology not be adopted until the calculations of all applicants can be prepared and reasonable limits discerned, if any, from those results. Additionally, the ITU-R methodology is premised on the necessity for NGSO FSS antennas being capable of pointing in different, or perhaps even multiple, directions. This premise is not valid for the Pentriad system's planned fixed-antenna ground receivers. With a ten degree in-line interference avoidance angle, service to customers with fixed-antenna ground receivers will be momentarily interrupted. While the interruptions for a HEO system such as Pentriad, however momentary, may be corrected by the utilization of signal processing and restoration software, the realization is that the interruptions will occur with greater frequency than for other NGSO FSS systems - a consequence surely not intended by the Commission's recommendation for adoption of the ITU-R methodology. In proposing this method, the Commission expected that separate NGSO satellite systems could share and operate throughout the same spectrum frequency as long as they avoid in-line interference events, but the adoption of the proposed methodology will not generate the desired results.

### III. THE COMMISSION HAS MISINTERPRETED DENALI'S STATEMENTS REGARDING IN-LINE INTERFERENCE EVENTS IN PRIOR PROCEEDINGS

The Commission described an in-line interference event as an unintentional transmission in either direction between an Earth station of one system and a satellite of another caused by physical alignment. During such an in-line event, an NGSO FSS Earth station would receive the highest interference level from the other NGSO FSS system's transmitting satellite when the satellite mainbeam transmission is aligned with the Earth station antenna. Conversely, the other NGSO FSS system's satellite would receive the highest interference level by the in-line transmission path of the Earth station's mainbeam transmission. The Commission noted that Denali, asked in earlier comments to the Commission, to adopt the avoidance of in-line interference events. However, the Commission did not recall that Denali expressly asked for a modification to the Commission's then-offered "Option 4: Homogenous Constellations." Denali reiterates its strongest opinion that HEOs and LEOs are sufficiently different to be treated separately. Doing so would, for example, eliminate the entire issue concerning "high-powered uplinks" raised in the R&O. The ITU has determined that several NGSO FSS systems can share the same frequency band without interference when they employ nearly identical orbital parameters to minimize intersystem interference. The systems transmission characteristics must also remain at a relatively uniform

level. An equal amount of spectrum allocated to each design, therefore would require each licensee to share its spectrum assignment with systems of a like design.

The Pentriad system does not require, and Denali does not request, an exclusive allocation of frequency spectrum in the Ku-band. The Pentriad system employs a novel system design which allows for multiple uses of the frequency spectrum. Because the operational service arc of the satellites is between 44.8 degrees North Latitude and 63.5 degrees North Latitude, Pentriad can operate without interfering with satellites in the geostationary/geosynchronous orbit using the same frequencies. The Pentriad system design also allows for the implementation of multiple systems in other Molniya orbits by maintaining spatial diversity between the operational arcs of the satellites (geosynchronous satellites at zero degrees Latitude plus or minus five degrees North and South and the Pentriad HEO satellites operating between 44 degrees North Latitude and 64 degrees North Latitude). Thus, there is an effective separation of 39 degrees between GEO satellites and the operational arc of the Denali HEO satellites. Denali estimates that with twelve (12) longitudinal degrees spacing, up to six systems identical to Pentriad could operate without mutually harmful interference. With coordination, even more systems could be accommodated.

The Pentriad system also can be coordinated with NGSO systems operating in the LEO and/or Medium Earth Orbit ("MEO") orbits because of the geostationary-like attributes of the Pentriad system. The LEO can use the same mitigating measures to avoid interference with HEO (Molniya orbit) satellites, such as Pentriad, that are proposed for LEO to avoid interference with geostationary/geosynchronous satellites.

Denali believes that the NGSO sharing problem must be stated in a three-dimensional

space, spectrum and angular area. As was implicit with GSO sharing, the geometrical laws of orbit dynamics must also be considered. We believe that the Commission must include in its formulation of the Ku-band NGSO FSS sharing question an important division into two classes; LEO/MEO and HEO. The characteristics of the two classes are distinguished in terms of number of satellites and ground station complexity.

Molniya NGSO systems would be put at great disadvantage if a special interference mitigation capability were required of them to enable LEO/MEO NGSOs to operate through the Molniya belts. Such a requirement would not be similar to requiring an interference mitigation capability of GSOs. On the other hand, we believe that adding the Molniya belts to the areas on the celestial sphere in which the LEO/MEO NGSOs must avoid interference is a small burden on the LEO/MEO NGSO systems. When thought of in terms of two classes of non-interfering NGSOs, the options become more appealing. Denali's modification suggests how LEO/MEO NGSO's may avoid interfering with Molniya NGSOs, just as they avoid interfering with GSOs.

Recognizing the potential for high-powered systems to tip the balance by creating spectrum inefficiencies, the FCC seeks comment on whether a second angular separation for higher power systems is needed, and if so, what angle should be used. If comments indicate that the FCC should indeed require another angle of separation for high-powered systems, the FCC requests that the comments also provide and justify the power flux density level limitation that would be needed as a trigger level. A system that achieves the trigger level would be defined as a "high-powered system" for this purpose. In an ex parte presentation, SkyBridge proposed defining as a "high-powered uplink" an on-axis PFD in excess of 18 dBW/m<sup>2</sup>/40 kHz and an off-axis PFD at 10-degrees or greater in excess of -10 dBW/m<sup>2</sup>/40 kHz.

However, in citing this proposed definition, the Commission is not

considering that it is far less taxing on the applicants to specify a limit on the off-axis EIRP of Earth stations, rather than relying on PFD calculations. A PFD specification would have to define the location, relative to the Earth station, from which the PFD is measured (e.g., describing the azimuth, elevation, and range). Asking each applicant to calculate PFD levels for all azimuth-elevation-range combinations is an impractical burden. If the FCC adopts input power flux density limitations, the impact of that rule would be felt most by systems with highly elliptical orbits, because the distance from the Earth to their space stations creates a greater path loss, and requires higher transmitter power than satellites with lower operating altitudes. If HEOs and LEOs are treated separately, as proposed by Pentriad, then this will not be a significant issue.

IV. THE COMMISSION SHOULD NOT REQUIRE NGSO FSS APPLICANTS TO PROVIDE SERVICE COVERAGE TO AREAS ENCOMPASSING THE SOUTHERN HEMISPHERE WHEN NORTHERN HEMISPHERE COVERAGE IS SUFFICIENT

Denali does not support the requirement imposed by the Commission that applicants must provide service coverage to geographic areas in Southern Hemisphere, wherein such coverage would not serve the public interest and would only be at the expense of requiring additional coordination with other NGSO FSS systems, thereby increasing the cost of system deployment and operation. In a depressed telecommunications market, the Commission should reconsider its requirement for Southern Hemisphere coverage. Denali asserts that this requirement would be an unnecessary economic burden for nascent satellite systems.

Respectfully submitted,  
Denali Telecom LLC

By \_\_\_\_\_

Dennis J. Burnett  
President, Pentriad North America, Inc.  
Manager of Denali Telecom, LLC  
517 S. Washington St.  
Alexandria, VA 22314  
703-683-3044

David L. Lihani  
Pierson & Burnett, LLP  
517 S. Washington St.  
Alexandria, VA 22314  
703-683-3044

Attorneys for Denali Telecom, LLC